



NU DASMARIÑAS

GESTS01X – Science, Technology and Society

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Week 3B-Historical Antecedents



Learning Outcomes

List down	List down scientific and technological inventions across time.
Discuss	Discuss the historical antecedents, e.g., social, cultural, economic, and political contexts, which shaped and was shaped by the development of S&T across time.
Discuss	Discuss Philippine scientific and technological inventions and how these, too, shaped and were shaped by various social contexts.



What is a **Historical Antecedent**?

An **antecedent** can be defined as a precursor to the unfolding or existence of something. Thus, in the context of Science & Technology, **historical antecedents** can be understood as the previous state of science and technology or previous scientific and technological tools that paved the way for more advanced and sophisticated Science and Technology to arise.



Ancient Period

The rise of ancient civilizations paved the way for advances in S&T. The advances in S&T during the ancient period allowed civilizations to flourish by finding better ways of living, communication, transportation, and self-organization.

Ancient Wheel

Before the invention of wheels, civilizations only used animals for transportation. Despite the uncertainty of when or who invented the wheel, there is a general agreement that it grew out of the **potter's wheel** that was invented by the Sumerians shortly after 3500 BC when a potter initiated that if the potter's wheel is shifted to a 90-degree angle, it can be used for transportation. Nonetheless, it was not until 1000 to 1500 years later that the wheel was first used on carts.



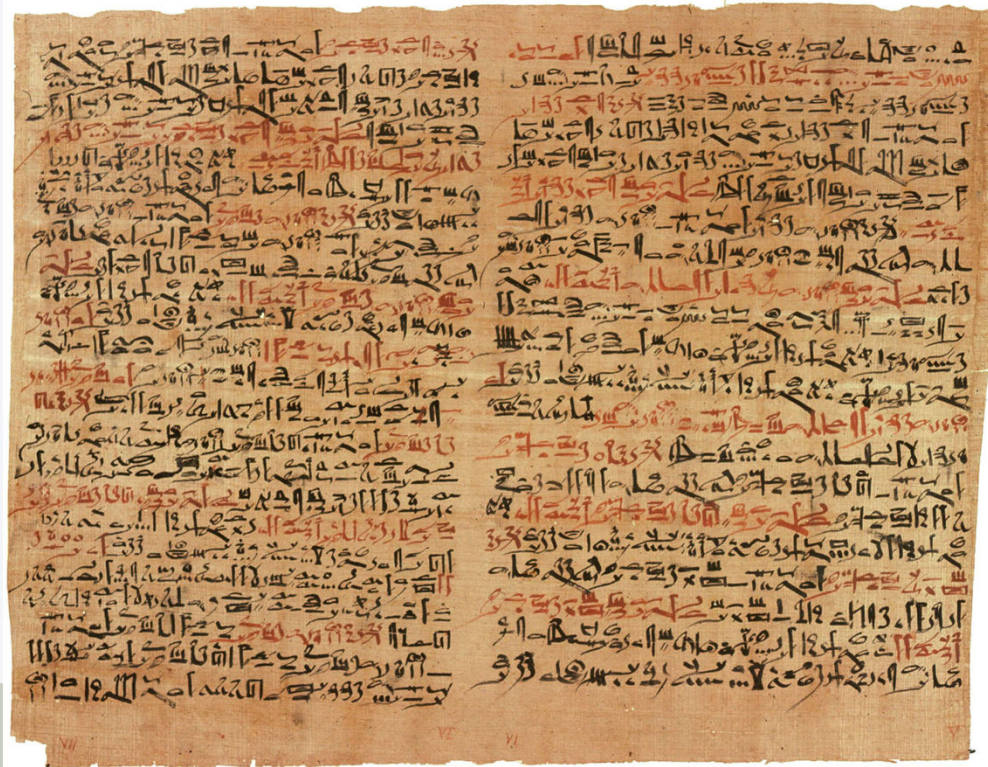
Sumerian Wheel



Potter's Wheel

Paper

Before, writing was done on stone. Since it was difficult to write on stone, writing was reserved for special occasions.



Edwin Smith Papyrus

Shadoof (Shaduf)

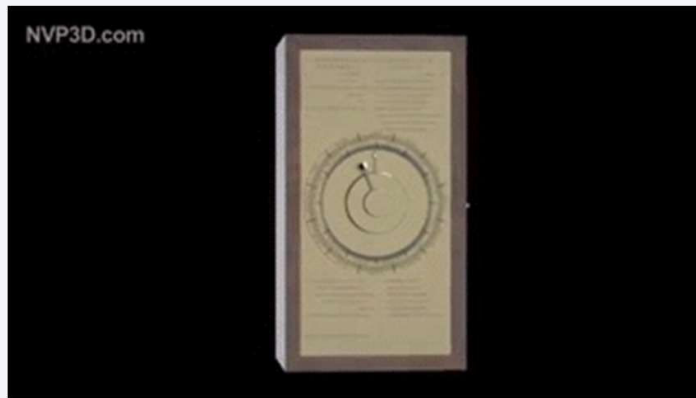
Among Egyptians near the Nile river, irrigation was necessary to water their crops. For that reason, ancient Egyptians introduced the idea of a tool that can lift things using counterweights and invented the **shadoof** or **shaduf** which can lift water. Because of this, irrigation and farming became much more efficient.



Shaduf mechanism

Antikythera mechanism

Even before the invention of the modern computer, the Greeks had already invented the ancient world's analog computer orrery. Discovered in 1902 and retrieved from the waters of Antikythera, Greece, the **Antikythera mechanism** is similar to a mantel clock. As the knob on the side moves forward or backward, its mechanism allows it to display celestial time. It was believed to predict astronomical positions and eclipses for calendar and astrological purposes. This mechanism which is one of the oldest known antecedents of modern clockwork, was also believed to be invented by Greek scientists between 150 – 100 BC.



Antikythera mechanism



Aeolipile (Hero's Engine)

The **Aeolipile** or the *Hero's Engine* is widely believed to be a precursor of the steam engine.



Aeolipile (Hero's Engine)



Middle Ages

- Major advances in scientific and technological development
 - steady increase of new inventions
 - introduction of innovations in traditional production
 - emergence of scientific thinking and method.
- Many medieval universities at the time stirred scientific thinking and provided infrastructure for scientific communities to flourish.
- Some of humanity's most important, present-day technologies could be traced back to historical antecedents in the Middle Ages

Heavy Plough

“The heavy plough turned European agriculture and economy on its head. Suddenly the fields with the heavy, fatty and moist clay soils became those that gave the greatest yields.”

– University of Southern Denmark professor Thomas Bernebeck Andersen



Heavy Plough

Gun Powder

Around 850 AD, Chinese alchemists accidentally invented **gun powder** or **black powder** as an attempt to create the elixir of life, which is why they called it *huoyao*, roughly translated as fire potion.” Before, spears and swords were used in combat but with this invention, combat and warfare became more advanced, paving the way for cannons and grenades from fiery arrows.



Gun Powder

Paper Money

Before, gold and silver were used as currency, until the invention of paper money in China in the 17th century AD as an offshoot of block printing. Traders and merchants realized the advantage and efficiency of paper money because it was easier to transport around than the previous currencies.



Paper Money

Mechanical Clock

The development of the **mechanical clock** paved the way for accurately keeping track of time. It changed the way days were spent and work patterns were established, particularly in the more advanced Middle cities.



Mechanical Clock

Spinning Wheel

The **spinning wheel** was used for transforming fiber into thread or yarn and eventually woven into cloth on a loom, and believed to be originated in India between 6th and 11th century AD. According to White (1974), this invention sped up the rate at which fiber could be spun by a factor of 10 to 100 times. Thus, White argued that it ushered a breakthrough in the linen production in 13th century AD in Europe.



Spinning Wheel



Modern Ages

- World population steadily increased.
- People of the modern age realized the utmost importance of increasing the efficiency of transportation, communication, and production. Industrialization took place.
- But greater risks in human health, food safety, and environment rose.
- These had to be simultaneously addressed as scientific and technological progress unfolded at an unimaginable speed.

Compound Microscope



Janssen's Compound Microscope

Telescope

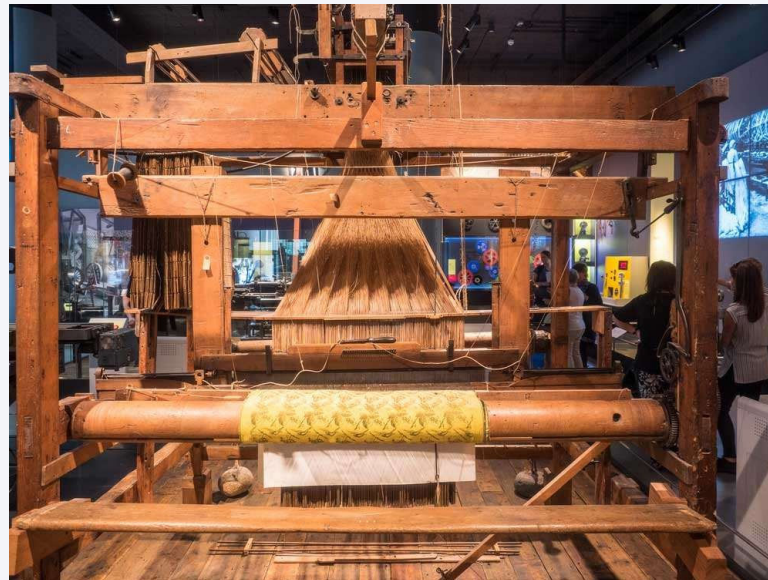
The single, most important technological invention in the field of astronomy during the Modern Ages was the practical **telescope** by Galileo Galilei.



Galileo Galilei Telescopes

Jacquard Loom

The **Jacquard loom** was considered as one of the most critical drivers of the Industrial Revolution. Built by French weaver Joseph Marie Jacquard.



Jacquard Loom



Engine-Powered Airplane

Orville Wright and Wilbur Wright are credited for designing and successfully operating the first engine-powered aircraft.



Wright Engine-Powered Airplane

Television

The Scottish engineer John Logie Baird is largely credited for the invention of the modern television. Baird successfully televised objects in outline in 1924, recognizable human faces in 1925, and moving objects in 1926, and projected colored images in 1928.



Baird's Television



Inventions of Filipino Scientists

- The Philippines boasts of its own history and tradition of scientific and technological innovation.
- Filipino scientists have long been known for their ingenuity. As with all other inventions, necessity has always been the mother of Philippine inventions.
- Most Filipino inventions appealed to the unique social and cultural context of the archipelagic nation.
- Even during the ancient period, our Filipino ancestors developed scientific and technological innovations focused on navigation, traditional shipbuilding, textiles, food processing, indigenous arts and techniques, and even cultural inventions.

E-jeepney

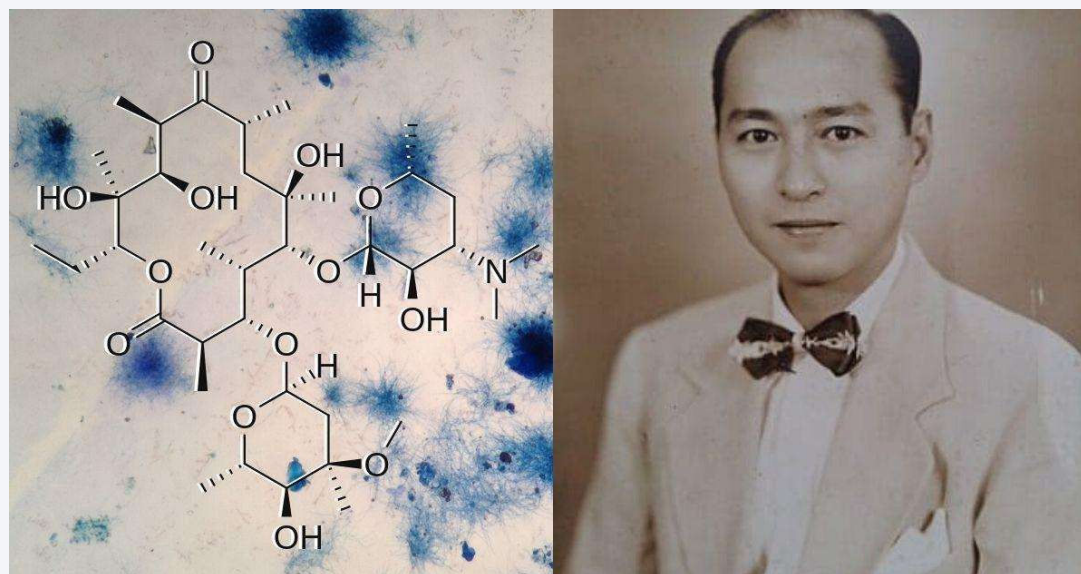
Jeepney is one of the most recognizable national symbol of the Philippines (as well as the most enduring symbol of Filipino ingenuity) and the most used mode of transportation in the country.



E-Jeepney

Erythromycin

Ilonggo scientist, Dr. Aguilar Abelardo was testing samples of soils from his backyard and isolated micro-organisms – a bacteria that lead to the development of the antibiotic called **Erythromycin** in 1949. However, he was not credited for this discovery (like other local scientists) by Eli Lilly Co., his US employer, to whom he sent the strain for separation and the company eventually owned the merits for this discovery.



Erythromycin and Dr. Aguilar Abelardo

Medical Incubator

In an attempt to support families in remote villages without electricity, del Mundo invented a bamboo incubator in 1941.

The Children's Medical Center opens in 1957

To fulfill her dream of building a hospital dedicated to the care of children, Dra. del Mundo sold her home and took out a hefty loan to help fund the construction of a pediatric hospital in Quezon City.

On November 27, 1957, her forty-sixth birthday, the Children's Medical Center opened its doors to the public. In 2002, it was renamed Fe del Mundo Medical Center in honor of its founder.



'Angel of Santo Tomas'

In 1941, Dra. Fe del Mundo joined the International Red Cross and cared for the children of foreign soldiers detained at the internment camp at the University of Santo Tomas. Her humanitarian activities gave her the title, 'The Angel of Santo Tomas'.



Multi-awarded Pediatrician

Among more than 250 citations and honors, Dra. Fe del Mundo received these awards...

- 1966 - Elizabeth Blackwell Award for outstanding service to humanity from Hobart and Smith College in Geneva, New York.
- 1977 - Most Distinguished Pediatrician and Humanitarian Award from the International Pediatric Association
- 1977 - Ramon Magaysay Award for Public Service
- 1978 - Named National Scientist of the Philippines, first Filipino woman to be cited
- The 15th International Congress of Pediatrics Award as most outstanding pediatrician and humanitarian.
- 2008 - The Blessed Teresa of Calcutta Award of the AY Foundation.
- 2010 - Order of Lakandula with the rank of Bayan from President Gloria Macapagal-Arroyo



Researcher, innovator, public health advocate

Dra. del Mundo's many accomplishments have changed the lives of millions. Among her notable inventions was a makeshift incubator devised for use in places with no electricity. It consisted of two laundry baskets of different sizes, the smaller basket put inside the bigger one, with hot water bottles fitted into the space between them and oxygen tubes attached; a hood covered the contraption. She was known for her pioneering work on infectious diseases like dengue fever, her activities in rural communities, her push for stronger collaboration between hospitals and community doctors and the public, midwives and the medical community. Her devout Catholicism notwithstanding, she was an advocate of family planning and population control. She authored over a hundred articles, reports and articles in medical journals and the 'Textbook of Pediatrics', a fundamental medical text used in Philippine medical schools.



Triumph from Tragedy

A story of a little lady with a big heart who dedicated her whole life to the care of children.

Fe del Mundo was born in Intramuros Manila, the sixth of eight siblings, four of whom died as children. This family tragedy turned the young Fe towards the medical profession. In 1923, she earned her medical degree at the University of the Philippines Manila, graduating with top honors.



First female student at Harvard Medical School

In 1936, she became the first woman and the first Asian to study at the Harvard Medical School. After a two-year research fellowship at Harvard's children's hospital, she went on to earn a medical degree in bacteriology at Boston University in 1940.



"I feel that if you give the world the best that you can, the best will always come back to you."
- Dra. Fe del Mundo

DID YOU KNOW?

National Scientist
Fe del Mundo
designed a prize winning low cost incubator made of bamboo. It is cheap and easy to make since bamboo is found in barrio. This simple incubator has saved many lives.

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Dr. Fe del Mundo's Legacy

Mole Remover

Dr. Rolando dela Cruz is credited for the invention of a mole remover that can easily remove moles and warts without the need for any surgical procedure shot which made use of extracts of cashew nuts (*Anacardium occidentale*) in 2000.



Dr. Rolando dela Cruz and his Mole Remover

Banana Ketchup (Banana Sauce)

Historical accounts posit that Filipino food technologist, Maria Ylagan Orosa, invented the **banana ketchup** at the backdrop of World War II when there was a huge shortage of tomatoes.



Maria Ylagan Orosa and Banana Ketchup

References

- Quinto, E. J. &, Nieva, A. (2019). Science, Technology, and Society: Outcome-Based Module (pp.15-27). C&E Publishing, Inc.